

REVISION OF THE MILLIPED GENUS *DYNORIA*
(POLYDESMIDA: XYSTODESMIDAE)

Rowland M. Shelley

Abstract.—The milliped genus *Dynoria* is unique in the tribe Apheloriini by lacking torsion in the acropodites of the male gonopods. Thus, the prostatic groove does not cross from the medial to the lateral surfaces but runs entirely along the former until it reaches the distal solenomerite. *Dynoria* is comprised of two species, *D. icana* Chamberlin and *D. medialis* Chamberlin, which differ chiefly in the configuration of the solenomerite and the presence (*icana*) or absence (*medialis*) of a parasolenomerite. The species are widely allopatric with *D. icana* occurring in the southeastern corner of the Blue Ridge Province and *D. medialis* in central and southwestern Georgia. *Dynoria* and its close relative *Furcillaria* occupy a separate evolutionary branch of the Apheloriini, and are distantly related to the "sigmoid" taxa. They are remnants of an early piedmont immigration wave from the Appalachian mountains, and all the species except *D. medialis* seem headed toward extinction.

The milliped family Xystodesmidae is the dominant faunal element in the southeastern United States. Genera like *Apheloria*, *Sigmoria*, *Cherokia*, and *Pleurolooma* occur throughout much of the region and have been collected repeatedly since the mid-19th century. Consequently, they were often cited in taxonomic publications and became entangled in nomenclatorial confusion. Clarification has recently been achieved of the last three through tedious, painstaking revisions, in which all past names were reevaluated, all type specimens reexamined, and all valid species and subspecies redescribed and illustrated (Hoffman 1960; Shelley 1980, 1981a). Not all southeastern genera are this widespread, however; some occur in only one or two states or are restricted to a single physiographic province. These taxa have rarely been encountered by field collectors and have therefore received only a few citations. Consequently, their taxonomy enjoys greater stability and can be easily reviewed. One such genus is *Dynoria*.

The first specimen of *Dynoria* was collected in 1910, but it was not described until 1939, when Chamberlin established the genus for the type species, *D. icana*. In 1947 he proposed a second species, *D. parvior*, from the mountains of northern Georgia, but Chamberlin and Hoffman (1958) correctly assigned this binomial to the synonymy of *Cherokia georgiana* (Bollman). Chamberlin (1949) described *D. medialis* from Atlanta, and both *D. icana* and *D. medialis* were listed in the 1958 checklist as components of the American fauna. Hoffman (1979) assigned *Dynoria* to the tribe Apheloriini and reported that it consisted of two species in the southeastern states.

As with most Chamberlinian diagnoses and descriptions, those of *Dynoria* and its two species are inadequate by modern standards, amounting to mere validation statements for the scientific names. The illustrations are rough sketches that do

not begin to reveal the important features and complexity of the *Dynoria* gonopod. Consequently, Shelley (1981b) had to deal briefly with *Dynoria* and put forth a short generic definition in order to diagnose adequately the new, related genus *Furcillaria*. *Dynoria* was defined as the only genus in the tribe Apheloriini lacking the characteristic torsion of the acropodite at $\frac{1}{4}$ to $\frac{1}{3}$ length, which results in a crossing of the prostatic groove from the medial to the lateral surfaces. In *Dynoria*, the groove runs entirely along the medial side of the acropodite stem and is visible solely from this perspective until it passes onto the apical solenomerite. The groove is therefore obscured in lateral aspect, except for the terminal part on the solenomerite. These statements by Shelley (1981b) are the only definitive remarks ever made on *Dynoria*, and are expanded here into a formal generic diagnosis with parallel accounts of the two species. Relatively few preserved specimens of *Dynoria* are available in museum and private collections, and their repositories are indicated by the following acronyms in the species accounts:

AMNH—American Museum of Natural History, New York, New York.

CC—Biology Department, Columbus College, Columbus, Georgia.

FSCA—Florida State Collection of Arthropods, Gainesville, Florida.

NCSM—North Carolina State Museum of Natural History, Raleigh, North Carolina. The invertebrate catalog numbers of material in this collection are indicated in parentheses.

RLH—Private collection of Richard L. Hoffman, Radford, Virginia.

RVC—Private collection of Ralph V. Chamberlin, now being accessioned by the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Taxonomic Characters

The taxonomic characters of *Dynoria* are found exclusively on the gonopods, and allow for easy recognition of the genus and distinction of the species. Color pattern has no taxonomic value because sympatric species of *Cleptoria* and other genera also exhibit the red paranota and metatergal stripes of *Dynoria*. Likewise in *Dynoria*, the length and configuration of the process of the fourth sternum are not sufficiently different from their conditions in other genera to allow for authentic determinations.

The most important diagnostic character of the gonopods of *Dynoria* is the aforementioned absence of torsion in the acropodite. No other xystodesmid genus in the eastern United States, in any of the four tribes, displays this trait.

At the species level, the taxonomically useful characters are located distally on the acropodite, at the division into tibial process and solenomerite branch. Differences in the length and configuration of the solenomerite branch are important along with the presence or absence of further division into a solenomerite proper and a parasolenomerite. In *D. medialis* the solenomerite branch is not subdivided and curves across the stem of the acropodite medial to the tibial process. A parasolenomerite is present in *D. icana*, and the solenomerite is directed subanteriorly, away from the stem of the acropodite. Thus in *D. icana*, the tibial process is completely visible in medial view, whereas in *D. medialis* it is largely obscured by the solenomerite.

Dynoria Chamberlin

Dynoria Chamberlin, 1939:7.—Chamberlin and Hoffman, 1958:31.—Hoffman, 1979:159.

Type-species.—*Dynoria icana* Chamberlin, 1939, by original designation.

Description.—A genus of large, robust xystodesmids with the following characteristics:

Body composed of head and 20 segments in both sexes; size varying from 10–11.5 mm wide and 41–49 mm long; W/L ratio similarly varying from around 22–25%. Body essentially parallel sided in midbody region, tapering at both ends.

Color in life the typical apheloriine pattern of red paranota and red metatergal stripes on black background.

Head of normal appearance, smooth, polished. Epicranial suture shallow, indistinct, terminating in interantennal region, not apically bifid; interantennal isthmus relatively wide; genae not margined laterally, with shallow central impressions, ends broadly rounded and projecting slightly beyond adjacent cranial margins. Antennae moderately slender, varying in length, becoming progressively more hirsute distally, with 4 conical sensory cones on ultimate article; no other sensory structures apparent. Facial setae greatly reduced, only clypeal and labral present.

Terga smooth, polished, becoming slightly coriaceous on anterior half. Collum variably broad, ends extending slightly beyond those of following tergite. Paranota relatively flat or moderately depressed, interrupting slope of dorsum in males but continuing slope in females, caudolateral corners rounded on anteriormost segments, becoming blunt in midbody region and progressively more acute posteriorly. Peritremata distinct, strongly elevated above paranotal surface; ozopores located at about midlength, opening subdorsad. Prozonites smaller than metazonites; strictures distinct, smooth.

Caudal segments normal for family.

Sides of metazonites irregular, with varying shallow, curved impressions. Strictures sharp, distinct. Pregonopodal sterna of males modified as follows: that of segment 4 with variable, apically divided process, shorter than or subequal to lengths of adjacent coxae; sternum of segment 5 with two small knoblike processes between 4th legs and two elevated, flattened areas between 5th legs; sternum of segment 6 with shallow convex recession between 7th legs. Postgonopodal sterna generally flattened, with varying shallow grooves and depressions, strongly bilobed on segment 8. Gonapophyses on 2nd leg pair of males short, only slightly elevated above coxal surfaces, with round, apical knobs. Pregonopodal legs densely hirsute; postgonopodal legs becoming progressively less hirsute caudally. Coxae with low tubercles in caudal half of body; prefemoral spines moderately long and sharply pointed; tarsal claws bisinuate. Hypoproct broadly rounded; paraprocts with margins strongly thickened.

Gonopodal aperture round to ovoid, with slight anterolateral indentations, front flush with metazonal surface, sides elevated. Gonopods in situ lying either entirely within aperture or slightly overlapping posterior margin; acropodites either lying beside each other and overhanging opposite coxa, or with tips overlapping. Coxae moderately large in size, without apophyses, connected by membrane only, no sternal remnant. Prefemur moderately large, without prefemoral process. Acropodites moderately thick and heavy, extending directly ventrad from prefemur, without torsion or twisting, divided at $\frac{2}{3}$ – $\frac{3}{4}$ length into lateral tibial process and

another more medial branch carrying prostatic groove, with or without further division. Tibial process usually short, straight, and subacute apically, usually subequal in length to solenomerite branch. Solenomerite branch either undivided and curving gently mediad to tibial process or divided basally into short, straight, blunt solenomerite and more caudal, sharply acute parasolenomerite. Latter lying close to and running parallel to solenomerite, extending across distal extremity of acropodite to tibial process, forming pocket on distomedial face of acropodite. Prostatic groove arising in pit in base of prefemur, running entirely along medial side of stem of acropodite to base of solenomerite, continuing on anterior or lateral sides of latter to terminal opening.

Cyphopodal aperture broad, encircling 2nd legs, sides elevated above metazonal surface. Cyphopods in situ located lateral to 2nd legs, variously oriented in aperture. Receptacle small, situated ventrad or dorsad to valves, surface finely granulate. Valves relatively large, equal or unequal in size, surface finely granulate. Operculum large or small, located under free end of valves.

Distribution.—Southeastern extremity of the Blue Ridge Province in North Carolina and Georgia, extending slightly into the Piedmont Plateau of western South Carolina and well into the Piedmont and Coastal Plain of central and southwestern Georgia. *Dynoria* has basically a north-south, longitudinal distribution, and the two species are allopatric with some 60 miles between them (Fig. 10).

Species.—Two. Due to the intensity with which the range of *Dynoria* and neighboring areas have been collected, I am confident that no additional species exist.

Remarks.—Both species of *Dynoria* have the typical apheloriine recession in the sternum of the 6th segment. This cavity is common in genera with curved acropodites that extend forward over the anterior edge of the aperture, and provides space for the acropodites when the body segments are compressed. However, the acropodites in *Dynoria* lie either within the aperture or overlap slightly the caudal margin. Hence, the depression is nonfunctional in this genus.

Dynoria icana Chamberlin

Figs. 1-5

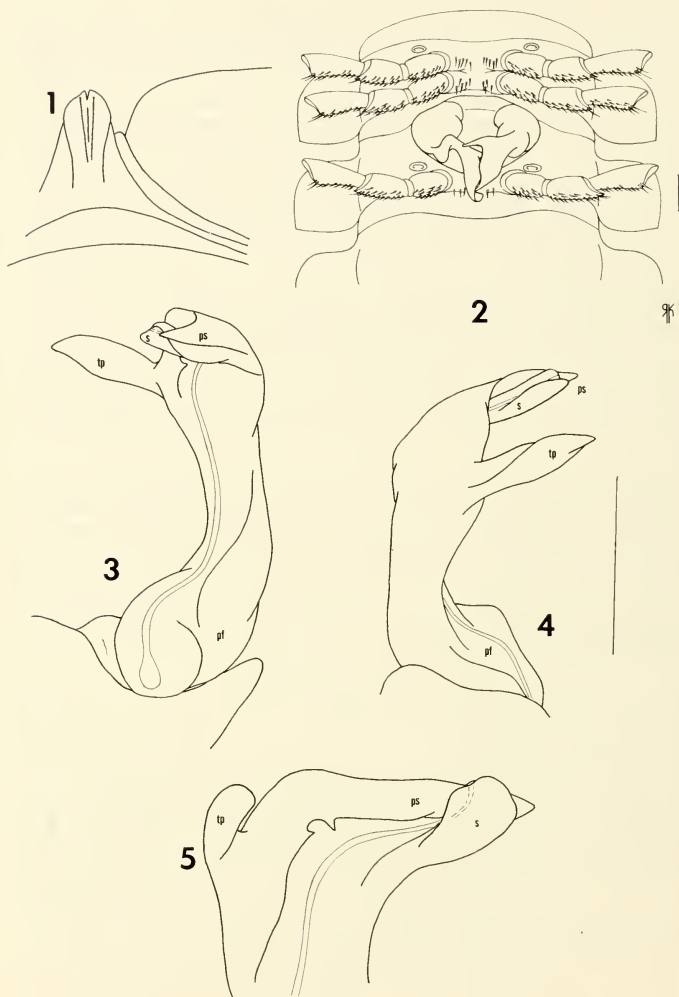
Dynoria icana Chamberlin, 1939:7, pl. 2, figs. 13-14.—Chamberlin and Hoffman, 1958:32.

Type specimens.—Male holotype and female allotype (RVC) collected by R. V. Chamberlin, 31 Jul 1910, from Tallulah Falls, Habersham County, Georgia.

Diagnosis.—Gonopods in situ with tips of acropodites overlapping each other and caudal margin of aperture; solenomerite branch divided into solenomerite proper and parasolenomerite; tibial process fully visible in medial view.

Holotype.—Body badly fragmented and unmeasurable; measurements taken from Rabun County specimen: Length 49.1 mm, maximum width 11.2 mm, W/L ratio 22.8%, depth/width ratio 60/7%, segmental widths as follows:

collum	7.8 mm	10th-14th	11.2
2nd	9.1	15th	10.6
3rd	9.6	16th	9.7
4th	10.1	17th	7.9
5th	10.6	18th	5.9
6th-9th	11.0		



Figs. 1-5. *Dynoria icana*. 1, Process of 4th sternum of holotype, caudal view; 2, Gonopods in situ, ventral view of male from Macon Co., NC; 3, Telopodite of left gonopod of holotype, medial view; 4, The same, lateral view; 5, Distal half of acropodite of male from Rabun Co., GA, dorsal view. pf,

Color in life not indicated. The four specimens that I collected were black with red paranota and red stripes along the caudal margins of the metaterga. There was also a red stripe along the anterior margin of the collum.

Head capsule smooth, polished; width across genal apices 5.1 mm; interantennal isthmus 1.9 mm. Epicranial suture shallow. Antennae extending caudad to middle of third metatergite; relative lengths of antennomeres $2 > 3 > 5 = 6 > 4 > 1 > 7$, 2-6 clavate. Genae not margined laterally, with shallow central impression, ends broadly rounded and extending beyond adjacent cranial margins. Facial setae as follows: epicranial, interantennal, frontal, and genal not detected and presumed absent; clypeal about 10-10, labral about 14-14.

Terga smooth, polished, with only slight wrinkling on anterior part of paranota. Collum moderate in size, ends extending slightly beyond those of following tergite. Paranota relatively flat, interrupting slope of dorsum; caudolateral corners rounded through segment 6, becoming blunt and progressively more pointed posteriorly. Peritremata distinct, clearly elevated above paranotal surface; ozopores situated at about midlength, opening subdorsad.

Sides of metazonites with varying shallow grooves and impressions. Strictures distinct. Sternum of segment 4 with moderate apically divided process between 3rd legs, subequal in length to widths of adjacent coxae (Fig. 1); sternum of segment 5 with moderately long knobs between 4th legs and elevated flattened areas between 5th legs; 6th sternum with shallow convex recession between 7th legs. Postgonopodal sterna flat, plate-like, with shallow, transverse and longitudinal grooves on segments 8-10, disappearing thereafter. Coxae with low, blunt teeth on segments 8-10, becoming more sharply pointed posteriorly and continuing to segment 17.

Gonopodal aperture broadly ovoid, 3.4 mm wide and 2.1 mm long at midpoint, indented anterolaterally, sides flush with metazonal surface. Gonopods in situ (Fig. 2, not this specimen), with acropodites projecting ventromedial from aperture, apices overlapping and overhanging caudal margin of aperture. Gonopod structure as follows (Figs. 3-5): Acropodite projecting directly ventrad from prefemur, not twisted or curved. Tibial process with smooth, continuous margins, apically subacuminate, directed subanteriorly, length subequal to solenomerite branch. Latter divided into solenomerite proper and parasolenomerite on caudal side. Solenomerite apically blunt with slight depression in midline, directed subanteriorly, with small, rounded basal lobe. Parasolenomerite apically acute, closely appressed to, and apically parallel to, solenomerite; outer margin forming distal extremity of acropodite, extending in sublinear fashion and bending proximal to insertion near base of tibial process; inner margin extending across medial face of acropodite stem to insertion at about $\frac{2}{3}$ length, forming pocket on distomedial face of acropodite, margin irregular, with two sharply pointed teeth near midlength. Prostatic groove arising in pit in base of prefemur, running entirely along

←
prefemur; ps, parasolenomerite; s, solenomerite; tp, tibial process. Scale line for Fig. 2 = 1.00 mm; line for other figs. = 1.00 mm for 1 and 5, 1.77 mm for 3-4. Setation is omitted from all sternal and dissected gonopod drawings in this paper.

medial side of acropodite, curving onto solenomerite and continuing to apical opening.

Female allotype.—Length 41.1 mm, maximum width 10.1 mm, W/L ratio 24.6%, depth/width ratio 75.2%. Agreeing closely with male in all somatic details; paranota only slightly more depressed. Cyphopods in situ with edge of receptacle and valves visible in aperture, valves directed anterolaterad. Receptacle small, situated ventrad to valves, surface finely granulate, margin finely scalloped. Valves relatively large and unequal, outer one larger, surface finely granulate. Operculum minute, hidden under free end of valves.

Variation.—The tibial process and parasolenomerite of *D. icana* vary in several respects. The former has a sinuous margin in the male from Clayton, Georgia, but otherwise it is straight with a slight lobe on the proximal edge. In most males the tibial process is parallel to, and subequal in length to, the solenomerite; however, in the South Carolina males it is longer and directed more ventrad. The parasolenomerite has a subterminal tooth in the specimen from near the Chatooga River, South Carolina and is directed more dorsad than the solenomerite in both South Carolina males. The number of teeth on the inner margin varies from two to four.

Ecology.—Despite intensive sampling in its range, I have only collected *D. icana* once, under a thick layer of leaves in a slight depression in mixed deciduous woods near Hartwell Reservoir. This was a rather dry, oak-hickory forest, 100 feet or so from the lake, and unlike the damp, moist habitat of most apheloriine species. The site was also unusual in its thick leaf layer, as opposed to the thin layers of maple or dogwood leaves under which most apheloriines occur.

Distribution.—The southeastern extremity of the Blue Ridge Province and adjacent fringe of the Piedmont Plateau in the contiguous corners of North Carolina, South Carolina, and Georgia (Fig. 10). The area lies mostly on the southern and western sides of the Savannah River, but as I noted in 1981, it spreads slightly across headwater rivers into the western fringe of Oconee County, South Carolina. Specimens were examined as follows:

NORTH CAROLINA: *Macon Co.*, 2.5 mi. W Otto, Coweeta Hydrological Station, 6 M, 9 Jul 1958, R. L. Hoffman (RLH).

SOUTH CAROLINA: *Oconee Co.*, 2 mi. N Mountain Rest, Ridge along Chatooga R. off SC hwy. 28, M, 21 Jul 1958, R. L. Hoffman (RLH); and 6.8 mi. S Westminster, along SC hwy. 67 near Hartwell Res., M, 3 F, 9 Jun 1978, R. M. Shelley and W. B. Jones (NCSM A2063).

GEORGIA: *Rabun Co.*, Clayton, M, Jul 1910, W. T. Davis (AMNH). *Habersham Co.*, Tallulah Falls, M, F, 31 Jul 1910, R. V. Chamberlin (RVC) TYPE LOCALITY.

Remarks.—Proper interpretation of the gonopod of *D. icana* is dependent upon understanding the parasolenomerite, but this is usually hampered by debris which accumulates in the pocket on the distomedial face of the acropodite. This must be removed with a fine insect pin to reveal the inner margin of the parasolenomerite. If it is not removed, the cavity can be easily overlooked even in a detailed examination, resulting in misinterpretation of the gonopod structure.

Chamberlin and Hoffman (1958) reported *D. icana* from Saluda, South Carolina, which is far from the actual range of the species and a highly doubtful locality. The male on which this record is based is in the Chamberlin collection,

but its gonopods are lost. The vial contains the label, "SC, Saluda, 5 August 1910, R. V. Chamberlin." I found this vial in a jar with others Chamberlin collected at Saluda, North Carolina, on the same date, one of which contained the holotype of *Sigmoria divergens*. Thus it is obvious that Chamberlin was in Saluda, North Carolina, on this date instead of Saluda, South Carolina, and that this specimen is of *Sigmoria divergens* rather than *Dynoria icana*. The Saluda, South Carolina, record is therefore deleted.

Dynoria icana seems a genuinely rare species. With all the collecting that has taken place over the past 50 years in the southern Blue Ridge Mountains, it has only been taken five times, and I only found it once in a dozen or so trips to the range. Population sizes appear to be small, as most samples have only one or two specimens. The species may be declining in numbers toward extinction, and thus a worthy candidate for state and national endangered species lists.

Dynoria medialis Chamberlin

Figs. 6-9

Dynoria medialis Chamberlin, 1949:3, figs. 5-6.—Chamberlin and Hoffman, 1958:32.

Type specimens.—Male holotype (RVC) collected by P. W. Fattig, 12 Jul 1946, from Atlanta, Georgia, without indication of the county or section of Atlanta.

Diagnosis.—Gonopods in situ with acropodites wholly enclosed within aperture, lying transversely beside each other and overhanging opposite coxa; solenomerite branch without parasolenomerite, not divided, curving gently anteriorly and obscuring much of tibial process in medial view.

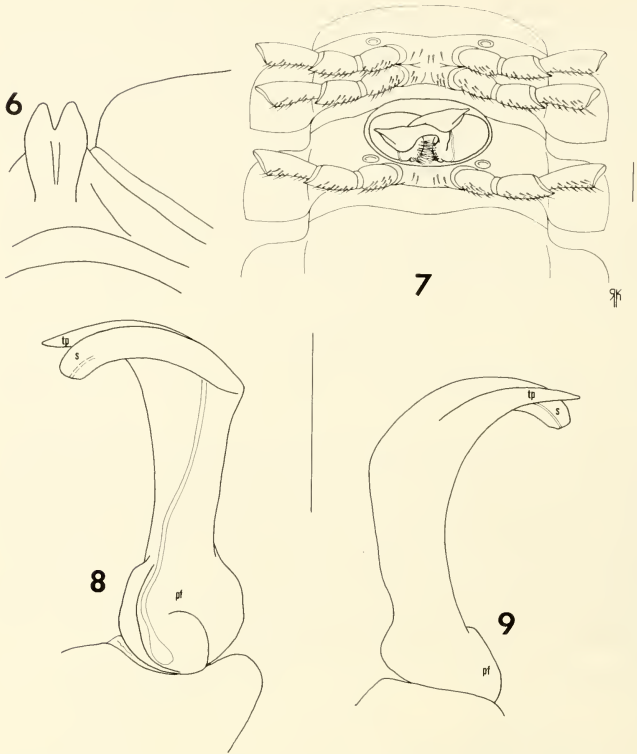
Holotype.—Body badly fragmented and unmeasurable; following segmental measurements taken from topotypical male collected in DeKalb County section of Atlanta in 1960: length 42.2 mm, maximum width 10.6 mm, W/L ratio 25.1%, depth/width ratio 57.5%. Segmental widths as follows:

collum	8.0 mm	10th-13th	10.6
2nd	9.1	14th-15th	10.2
3rd	9.4	16th	9.5
4th	9.8	17th	8.3
5th-9th	10.4	18th	6.3

Color in life not indicated, but all the specimens that I collected had the same markings as *D. icana*.

Somatic features similar to those of *D. icana* with following exceptions: Width across genal apices 5.4 mm; interantennal isthmus 2.7 mm. Antennae long and narrow, extending to middle of fourth tergite. Facial setae as in *D. icana* except labral about 16-16.

Process of 4th sternum apically divided, shorter in length than widths of adjacent coxae (Fig. 6); sternum of segment 5 with small lobes between 4th legs and elevated flattened areas between 5th legs; 6th sternum convexly recessed between 7th legs. Postgonopodal sterna flat, plate-like, with only faint, shallow, central impressions. Coxae with low blunt tubercles beginning on segment 10 and continuing to segment 17.



Figs. 6-9. *Dynoria medialis*. 6, Process of 4th sternum of holotype, caudal view; 7, Gonopods in situ, ventral view of male from Harris Co., GA; 8, Telopodite of left gonopod of holotype, medial view; 9, The same, lateral view. Abbreviations as in Figs. 1-5. Scale line for Figs. 6 and 7 = 1.00 mm, for Figs. 8 and 9, 1.77 mm.

Gonopodal aperture rounded, 3.7 mm wide and 2.3 mm long at midpoint, indented anterolaterally, sides flush with segmental surface. Gonopods in situ (Fig. 7, not this specimen) with acropodites projecting mediad from aperture, extending over coxa of opposite gonopod and lying wholly within aperture. Gonopod structure as follows (Figs. 8-9): Acropodite projecting directly ventrad from prefemur, not twisted or curved. Tibial process with smooth, continuous margins, apically acute, directed subanteriad, largely concealed in medial view by solenomerite. Solenomerite subequal in length to tibial process, curving gently across

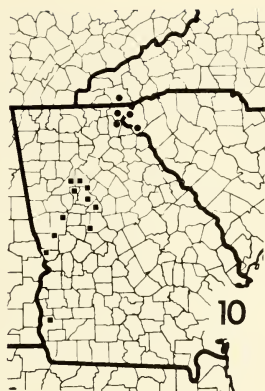


Fig. 10. Distribution of *Dynoria*. dots, *icana*; squares, *medialis*.

stem of acropodite on medial side of tibial process, margins smooth and continuous, tip blunt, directed downward (dorsad) toward coxa. Parasolenomerite absent. Prostatic groove arising in pit in base of prefemur, running entirely along medial side of acropodite to base of solenomerite, continuing onto lateral side of solenomerite to apical opening.

Female topotype.—Length 42.3 mm, maximum width 10.7 mm, W/L ratio 25.3%, depth/width ratio 26.5%. Agreeing closely with male in somatic features, except paranota more strongly depressed, giving appearance of more highly arched body.

Cyphopods in situ with valvular opening visible in aperture, valves directed ventrad. Receptacle small, located on caudal side of valves, surface finely granulate. Valves large, subequal, surface finely granulate. Operculum relatively large, clearly visible under medial end of valves.

Variation.—The only significant gonopodal variation in *D. medialis* involves the relative lengths of the solenomerite and tibial process in the southern part of the range. The former is much longer in the males from Muscogee and Early counties and curves appreciably dorsad apically, so that its overall configuration is of an arc with broad diameter.

Ecology.—All the specimens of *D. medialis* that I collected were found in moist spots under thin layers of leaves on relatively hard substrates.

Distribution.—The Piedmont Plateau and Coastal Plain of central and southwestern Georgia between the Chattahoochee and Ocmulgee rivers, ranging from Atlanta to just north of the common point of Georgia, Alabama, and Florida (Fig. 10). The species is restricted to Georgia and the eastern side of the Chattahoochee River. It has not been encountered in Alabama despite its occurrence in the adjacent tier of counties in southwestern Georgia. Specimens were examined as follows:



Fig. 11. Hypothetical dispersal routes for ancestral stock of *Furcillaria* and *Dynoria*. The dashed line is the approximate boundary of the southern Appalachian (Blue Ridge) Mountains.

GEORGIA: ?*Fulton Co.*, Atlanta, M, 12 Jul 1946, P. W. Fattig (RVC) and M, 2 Apr 1948, P. W. Fattig (RVC) TYPE LOCALITY. *DeKalb Co.*, Atlanta, M, F, Oct 1960, E. Davidson (FSCA). *Clayton Co.*, 0.4 mi. S Conley, M, 4 Dec 1960, L. Hubricht (RLH). *Rockdale Co.*, Panola Mountain State Park, M, 2 F, 30 Jul 1977, R. M. Shelley (NCSM A1611). *Henry Co.*, W of Ola, M, 4 Dec 1960, L. Hubricht (RLH). *Butts Co.*, Indian Springs State Park, M, F, 20 Nov 1977, R. M. Shelley (NCSM A1790). *Monroe Co.*, 1.5 mi. N Culloden, M, 4 May 1961, L. Hubricht (RLH). *Meriwether Co.*, 0.8 mi. N Avalon, M, 11 Mar 1961, L. Hubricht (RLH). *Harris Co.*, Franklin D. Roosevelt State Park, 3 M, F, 29 Jul 1977, R. M. Shelley (NCSM A1609). *Muscogee Co.*, Columbus, Columbus College Campus, M, 24 Jul 1974, collection unknown (CC). *Early Co.*, Kolomoki Mounds State Park, 2 M, 19 Nov 1977, R. M. Shelley (NCSM A1784), and 5 M, F, 1 May 1983, R. M. Shelley and P. B. Nader (NCSM A4022).

Remarks.—The range of *D. medialis* is much greater than that of *D. icana*, and it is also much more abundant in its range. The ease with which I have found it suggests that *D. medialis* would be encountered in most suitable habitats between Atlanta and a line connecting Macon and Columbus. South of this level, however, it becomes rare, and the Early County record is about 70 miles from Columbus, the closest locality. I have searched unsuccessfully in the intervening counties for *D. medialis*, and the Early County population may be disjunct from the main population in central Georgia.

Relationships and Evolution

With the common features of a lateral tibial process and a medial solenomerite, *Dynoria* and *Furcillaria* comprise a separate evolutionary branch in the Apheriini. Hoffman (1963) suggested that the lowland genera *Dynoria*, *Lyrranea*,

Cleptoria, and *Stelgipus* might constitute a separate tribe and listed potential characters of the tribe, but it is now evident that such a taxon is unjustified because of synapomorphies with more typical "sigmoid" apheloriine genera. These synapomorphies include the process on the 4th sternum, the depression in the 6th sternum, and, for *Furcillaria* and *Cleptoria*, the flanges on the medial faces of the acropodites. As mentioned in the generic account the sternal depression is non-functional in *Dynoria*, but its presence links the genus to those in the Apheloriini with curved or rounded acropodites, which project anteriorly from the aperture and insert into the depression when the body segments are compressed. The processes of the 4th sternum in both *Dynoria* and *Furcillaria* are similar to those of species of *Sigmoria*, *Brevigonus*, and other genera (Shelley 1981a, c), and another indicator of phylogenetic affinity. Finally, the flange on the peak zone of the acropodite in *Furcillaria* is in a similar position to, and apparently homologous to, those of most montane species of *Sigmoria*.

On the basis of these observations, I propose the evolutionary scheme depicted in Fig. 11. Ancestral "sigmoid" stock moved into the western Piedmont of South Carolina from the adjacent Blue Ridge Mountains, and a form lacking torsion split from the main population. The latter pushed eastward into South Carolina, and populations became progressively more isolated from each other as younger and more successful apheloriine competitors spread into the area. All that remains of this early penetration are the three species of *Furcillaria* (Shelley 1981b). The form without torsion, the proto-*Dynoria* stock, underwent a second dichotomy in the Savannah River Valley, with one descendant moving up the valley and reentering the mountains. The other spread farther into Piedmont Georgia, eventually reaching the Coastal Plain. Thus, I think that the presence of *D. icana* in the southern Blue Ridge is due to a reinvasion from the Piedmont, and that it did not originate there or migrate there from another section of the mountains.

The nature of the original ancestral stock cannot be surmised. No known Appalachian species of *Sigmoria* possesses an apically divided acropodite or even a vestigial tibial process, so *Furcillaria* and *Dynoria* are therefore the sole survivors of both an early line of descent in the Apheloriini and an early Piedmont immigration wave. The area in Georgia inhabited by *D. medialis* contains few other tribal representatives, and it therefore encounters little competitive resistance. *Cleptoria rileyi* (Bollman) and *Lyrranea persica* Hoffman are the only sympatric or nearly sympatric piedmont species, and an undescribed form of *Hubroria* is sympatric and syntopic at Kolomoki Mounds in the Coastal Plain of southwestern Georgia. However, population sizes of *D. icana* are small, and it is rarely encountered. The three species of *Furcillaria* occupy narrow, relictual ranges (Shelley 1981b: fig. 17) and probably experience strong competition from several sympatric apheloriine species. Habitat destruction within their ranges could accelerate the natural decline and bring them to extinction in a few decades.

Acknowledgments

I thank Richard L. Hoffman for the loan of specimens in his collection and access to the types of *D. icana* and *D. medialis* in the Chamberlin collection. Materials in the collections of the AMNH, FSCA, and Columbus College were kindly loaned by Norman I. Platnick, Howard V. Weems, Jr., and George E. Stanton, respectively. Specimens from Franklin D. Roosevelt, Indian Springs,

Kolomoki Mounds, and Panola Mountain state parks, Georgia, were taken with permission of the parks and Historic Sites Division, Georgia Department of Natural Resources. Figures 2 and 6 were prepared by Renaldo G. Kuhler, NCSM scientific illustrator. This study was supported in part by National Science Foundation grants numbers DEB 7702596 and DEB 8200556.

Literature Cited

- Chamberlin, Ralph V. 1939. On some diplopods of the family Fontariidae.—Bulletin of the University of Utah, Biology Series 5(3):1-19.
- . 1947. Seven new American millipeds.—Proceedings of the Biological Society of Washington 60:9-16.
- . 1949. A new genus and four new species in the diplopod family Xystodesmidae.—Proceedings of the Biological Society of Washington 62:3-6.
- , and Richard L. Hoffman. 1958. Checklist of the millipeds of North America.—Bulletin 212, U.S. National Museum, 236 pp.
- Hoffman, Richard L. 1960. Revision of the milliped genus *Cherokia* (Polydesmida: Xystodesmidae).—Proceedings of the U.S. National Museum 112:227-264.
- . 1963. A new diplopod genus and species from Georgia (Polydesmida: Xystodesmidae).—Proceedings of the Biological Society of Washington 76:113-120.
- . 1979. Classification of the Diplopoda. Museum d'Histoire Naturelle, Geneva, Switzerland, 237 pp.
- Shelley, Rowland M. 1980. Revision of the milliped genus *Pleuroloma* (Polydesmida: Xystodesmidae).—Canadian Journal of Zoology 58:129-168.
- . 1981a. Revision of the milliped genus *Sigmoria* (Polydesmida: Xystodesmidae).—Memoir 33, American Entomological Society, 140 pp.
- . 1981b. A new xystodesmid milliped genus and three new species from piedmont South Carolina (Polydesmida).—Proceedings of the Biological Society of Washington 94:949-967.
- . 1981c. A new millipedi of the genus *Brevigonus* from South Carolina, with comments on the genus and *B. shelfordi* (Loomis) (Polydesmida: Xystodesmidae).—Brimleyana, 6:51-60.

North Carolina State Museum of Natural History, P.O. Box 27647, Raleigh, North Carolina 27611.